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ABSTRACT

Presented is a programatic organization model which is applied to research needs in special education. Major advantages of the model are given to be that of providing for several research activities which focus on one common problem, reducing the duplication of research effort, providing greater efficiency in use of research personnel and resources, allowing for the use of common measurement units and data analysis to facilitate the comparison of data from all the research activities, and being able to conduct a number of projects concurrently. It is thought that the utilization of the model would yield information on a common research problem in less time than it would take to conduct a series of individual research projects. Application of the model would involve the setting of general and specific objectives, a project coordinator, several research teams each working on specific but related studies, field testing in schools and institutions, and dissemination of findings to the public. (Author/DB)

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An Application of the Programmatic Organization Model to Applied Research

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ABSTRACT

During the recent attempt to prepare an application for a programmatic research project, this conception for an organizational model was employed. It was believed that the major advantage of a programmatic research model would be that of: 1) providing for several research activities which focus on one common problem, 2) reducing the duplication of research effort and providing greater efficiency in use of research personnel and resources, 3) allowing for the use of common measurement units and data analysis which in turn facilitate the comparison of data from all the research activities, and 4) being able to conduct a number of projects concurrently. The utilization of this model would yield information on a common research problem in much less time than it would take to conduct a series of individual research projects.

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An Application of the Programmatic Organization Model to Applied Research*

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Introduction

The administration of research funds through an organizational model known as "programmatic research" has been in effect for several years in the field of education. Yet, the concept of programmatic research has been only loosely defined, and detailed descriptions of models in operation cannot be found. Therefore, during the course of preparing a programmatic research grant proposal, we found it necessary to go through a step by step analysis of the programmatic research model and its application to applied research.

Because of the potential impact that programmatic research can have on the coordination of research, we felt that it would be of value to share with our profession results of our efforts to develop a viable programmatic research model.

Need for Research

Recently, in a conference dealing with innovation in special education, Dr. Reynolds (1972) listed several factors that have created a great need for new models in special education. These factors include the knowledge that if all handicapped children were being served under the current models, we would need more than three times the 80,000 or more persons who are currently employed in the field of special education in this country. Researchers are therefore interested in finding ways of managing the instruction of these children that are more economical and immediately available.

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A second important factor is the rapid change taking place in regular education which is characterized by team teaching, middle schools, individually prescribed instruction, and ungraded student placement. Traditionally trained teachers will have to be provided with help in coping with these rapid changes.

Another factor with far-reaching consequences is the growing belief that special education has been a "baby sitting" service to remove deviant students from the regular classroom environment. Commissioner Edwin Martin, Jr., has also discussed the need to provide handicapped students with the skills they will need to secure employment as adults; less than forty percent of handicapped graduates are presently fully employed. To improve the relevance of programs offered to these students would be to answer an obvious need and not merely to provide "baby-sitting."

These factors plus others identified by the Bureau of Education for the Handicapped point up both the need for systematic research in the area of classroom behavior management and curriculum development, and the critical need to develop procedures and curriculum materials for educating handicapped children.

Based on past experience, it is our belief that the research questions raised by these needs can best be answered by using the applied research paradigm in a programmatic mode.

Applied Research

Applied research is concerned with the investigation of observable, measurable behaviors rather than with theoretical speculation concerning hypothetical inner states. Also, meaningful investigation often requires the intense, continuous study of individual subjects or small groups, and not merely the averaging of effects of infrequently measured variables over large groups of subjects. Early research in special education by Haring and Phillips (1962) utilized such an approach when looking at specific procedures for teaching

emotionally disturbed children. Later, Hewett (1968), utilizing the behavioristic point of view, investigated the learning problems of children in the engineered classroom. Following these early behavioristic research efforts, there has been a virtual explosion of applied classroom research in special education by numerous investigators of whom a partial list would include such names as: Becker (1971), Haring (1972), Hall (1970), Hewett (1968), Lindsley (1966), Lovitt (1970), O'Leary (1967), Patterson (1968), Homme (1969), Starling (1972), Walker (1972), and White (1972). Results from these studies have provided useful information to the teacher on how to improve pupil performance, refine instruction, and control classroom behavior. However, even though past efforts have provided better techniques for the education of handicapped children today, a great need remains to continue our efforts to improve the quality of educational management that will be available tomorrow.

Programmatic Research

All programmatic research applies the talents of many investigators to a common area of research. However, an essential characteristic of programmatic research is the organizational approach taken to investigate a variety of research questions. Specific objectives are established and then a critical mass of talent is brought together to share expertise in solving the particular problems encountered in progressing towards those objectives. The common background and techniques of the researchers are optimally employed in programmatic research; this experimental framework assures a convergence of their final procedures and products.

The major advantages of programmatic research are: first, it allows for a number of activities investigating a common problem. Ideally, educational

sources of information are generated out of the combined results of related research projects. The initiation of several experiments within a programmatic organizational model, each attempting a slightly different dimension of a special problem, often provides a great deal more information than each researcher could provide if working alone. From that standpoint there is also a certain amount of economy in expenditure of funds; more outcomes and products are available than would be realized from individual research projects funded separately. Second, programmatic research usually is funded for longer periods than are single projects; so long as anticipated products are forthcoming, programmatic funding can be extended. This promotes research efficiency and enables teams to plan, to better attract personnel, and to achieve long-term gains from their accumulated expertise as they investigate common problems over an extended period of time.

Finally, the rationale for using programmatic research as an organizational model can be justifled to the extent that such a model prevents duplication, applies concerted effort to a problem, and efficiently utilizes research personnel and resources.

Applied Research Philosophy

The research philosophy that anyone concerned with education should adopt is guided by the ultimate aim of education: to change students' behavior so that a student lacking some skill or knowledge gains it. Researchers differ primarily about what they believe will change behavior. Often educators have advocated one or another method of changing behavior without systematic investigation ofwhether or not these methods would be successful with the pupils in their charge. Applied behavior analysis attends to the need for scientific method in educational research; this advantage is discussed below as the third characteristic of applied behavior analysis.

The principles of applied behavior analysis can serve as the foundation for the procedures used in an intensive investigation of behavior. These principles are based on two assumptions. The first assumption is that the primary data are the observable interactions between a biological organism and environmental events; and it is these interrelationships which constitute the material to be recorded (Bijou, Peterson, & Ault, 1968). The second assumption is that concepts and laws are to be derived from research which is based on precise measurement using experimental controls and numerous replications. For data to be of experimental value they must consist of units which describe interactions between behavioral and environmental events empirically. As an example, a student reads because of elements present in his environment; a teacher who wants to improve his reading will need measures of his initial reading behavior and data about environmental conditions that might be influencing it, and later will need data about the effects of changes the teacher has made in the student's environment to improve his reading performance.* We have found, however, that a measure of frequency is preferable to that of duration, intensity, and latency because, first, frequency shows changes over both short and long periods of time; second, it specifies the amount of behavior displayed; and, finally, it is applicable to a very wide range of behaviors.

The general procedure used in an applied analysis of behavior is to arrange experimentally an environment in which independent variables are systematically manipulated to change behavior. Frequently, the dependent variable is observed and recorded in terms of rate of responding, which has proven to be a sensitive barometer of performance and is applicable to a wide range of human responses. Three additional characteristics of the methodology used are 1) the precise specification and objective measurement of behavior; 2) a focus on environmental determinants; and 3) the use of empirical evaluations based on continuous measurement.

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*There are several measures which a teacher may use to determine changes in reading performance during the teaching/learning process.

Behavior analysis is primarily concerned with the observable things that children and teachers do. The concern is with observable behavior because technology has not yet provided a way to work with mental processes or internal events. However, because behavior is publicly observable, it is possible to define behavior units which can be empirically measured, experimentally manipulated, and repeated. The importance of this emphasis on units of behavior is that it provides sufficient specificity about what is being measured to insure that the effects of an independent variable can later be evaluated, and, if need be, replicated. In this way, we can find out if an intervention variable was successful; that is, if it changed the behavior predictably (Baer, Wolf, & Risley, 1968).

The second characteristic of applied behavior analysis is its focus on environmental determinants. The emphasis is on the environment because it is the environment which a teacher can control and manipulate in trying to develop desired changes in pupil behaviors. A teacher cannot change the genetic structure of his pupils or manipulate physiological and pharmacological variables in an effort to help his pupils learn. But he can change school environments to help children perform productively.

The third characteristic of applied behavior analysis is the use of empirical evaluations based on continuous measurement. In the past, educational innovations and practices have often been implemented without the benefit of objective examination of their effectiveness. If this mode of operation is continued it is doubtful if education will improve qualitatively. Experimentation, however, provides for an evaluation of innovations to take place, which will result in the discarding of those procedures which are ineffective or harmful and the validation and application of those procedures and products which are critical to the advancement of a technology of education.

These three research characteristics combine what are probably the most influential results of recent advancement in research technology and form a philosophical basis which can guide each research project in a comprehensive program project.

Research Strategy

All research involving a comparison of treatment effects involves experimental control (Sidman, 1960). In behavior analysis, control of variables is demonstrated through the use of one of two basic research strategies. These are the reversal design and the multiple baseline. The reversal or ABA design measures a behavior until it is relatively stable. Once stability has been achieved (baseline), an experimental variable (B) is imposed to see what effect it will have on the measured (dependent) variable. If there is an observable effect over a period of time, then condition A (baseline) is reinstated. The rationale for this procedure is that condition A provides a basis for predicting what the behavior would have been at a future time if the experimental condition had not been imposed. A return to baseline is accomplished for the purpose of testing the accuracy of the original prediction. If the level of behavior returns to baseline when the intervention (or treatment) is removed, then the original prediction has been confirmed (Hanley, 1970).

In applied settings, a major problem with the ABA design is the failure of a behavior to return to baseline due to learning. For instance, a non-reader who learns to read at 100 words per minute will not revert to illiteracy when the experimental phase ends. One can never get a valid indication of the effect of the experimental intervention in such an instance by using an ABA design. However, an effective alternative to the reversal design is the multiple baseline which involves the measurement of several variables over a period of time. At this time it is known that there are at least three different

multiple baseline designs possible for investigating behavior. There are designs to be applied a) across situations, b) across individuals, and c) across behaviors (Hall, Cristler, Cranston, & Tucker, 1970). Measurement across situations means that the same behavior of a single individual is measured concurrently in different stimulus situations. Measurement across individuals involves the concurrent measurement of the same behavior of several individuals in the same situation. Measurement across behaviors means that two or more behaviors of the same individual are measured concurrently while experimental procedures are applied to one behavior at a time.

Many variations of these designs are possible through combinations of elements of the two basic designs (reversal and multiple baseline), and many more will be developed as technology advances. The advantages of using these designs at this time are that they lend themselves to experimental manipulation which provides the process for finding answers to the question: "What controls behavior?" In addition, these designs enable researchers to gather data in ways which exemplify replication--which is the essence of reliability and generality. This design has great practical value when one is investigating experimental conditions affecting handicapped children. Each child serves as his own control, thus avoiding that almost impossible task of matching handicapped children or drawing a treatment population from a larger pool of handicapped children and attempting to provide control.

Common procedures which all Program Project experimenters utilizing applied research should probably implement in their research designs are depicted on the Research Procedures Flow Chart (Figure 1). Three of these procedures, however,

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Insert Figure 1 about here

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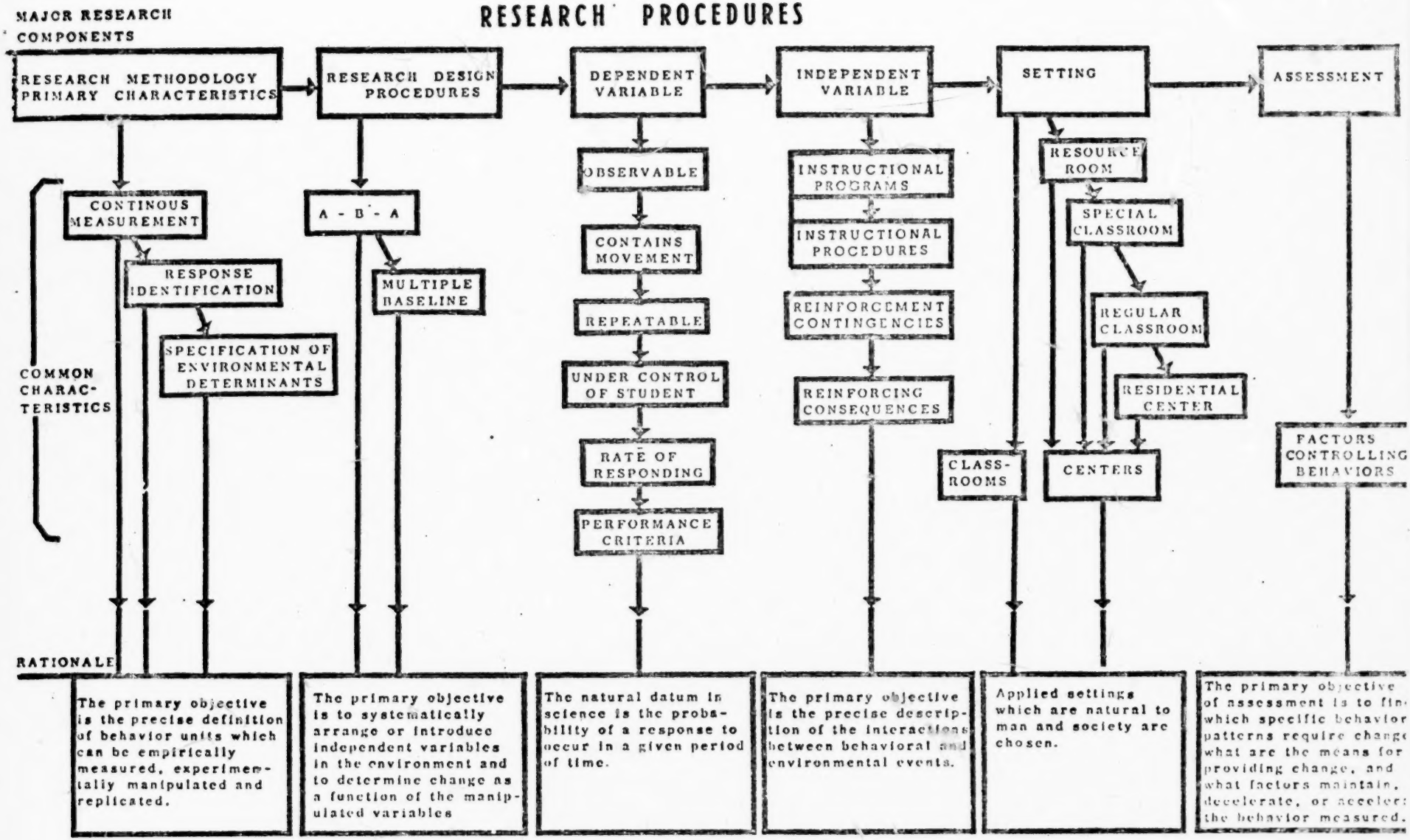
which must be utilized in every study are 1) direct observation, 2) continuous measurement of dependent variables, and 3) systematic manipulation of independent variables.

Figure 1


RESEARCH PROCEDURES
MAJOR RESEARCH COMPONENTS
RESEARCH METHODOLOGY PRIMARY CHARACTERISTICS
RESEARCH DESIGN PROCEDURES
DEPENDENT VARIABLE
INDEPENDENT VARIABLE
SETTING
ASSESSMENT
CONTINOUS MEASUREMENT
RESPONSE IDENTIFICATION
SPECIFICATION OF ENVIRONMENTAL DETERMINANTS
COMMON CHARACTERISTICS
A - B - A
MULTIPLE BASELINE
OBSERVABLE
CONTAINS MOVEMENT
REPEATABLE
UNDER CONTROL OF STUDENT
RATE OF RESPONDING
PERFORMANCE CRITERIA
INSTRUCTIONAL PROGRAMS
INSTRUCTIONAL PROCEDURES
REINFORCEMENT CONTINGENCIES
REINFORCING CONSEQUENCES
RESOURCE ROOM
SPECIAL CLASSROOM
REGULAR CLASSROOM
RESIDENTIAL CENTER
CLASS-ROOMS
CENTERS
FACTORS CONTROLLING BEHAVIORS
RATIONALE
The primary objective is the precise definition of behavior units which can be empirically measured, experimentally manipulated and replicated.
The primary objective is to systematically arrange or introduce independent variables in the environment and to determine change as a function of the manipulated variables
The natural datum in science is the probability of a response to occur in a given period of time.
The primary objective is the precise description of the interactions between behavioral and environmental events.
Applied settings which are natural to man and society are chosen.
The primary objective of assessment is to find which specific behavior patterns require change what are the means for providing change, and what factors maintain, decelerate, or accelerate the behavior measured.

Direct observation of the dependent variable requires that it first be identified in terms of observable movements the child makes which can be counted. Direct measurement by teacher and/or pupil recorders is the most common procedure used for direct observation.

Continuous measurement requires that each pupil's responses be monitored throughout the day. Only by such continuous recording can a valid, reliable index be provided of the effect of the conditions being investigated.

Finally, systematic manipulation of independent variables leads directly to 1) an analysis of the cause of change; 2) the technology for replicating that change; 3) an evaluation of the effectiveness of the change; and 4) an evaluation of the generalization of that change.

Programmatic Research Organization

The Program Project being conducted at the Experimental Education Unit is organized into three major research programs which include a number of research projects directly related to two basic problems being investigated. These two problems are set forth as priority concerns by the Bureau of Education for the Handicapped, and our research efforts are in part an attempt to attend to these priorities. This research program is a comprehensive one designed to investigate a wide variety of events and conditions which come to bear on the instruction and management of handicapped children in a variety of settings. The Program Project identifies the many variables that are involved in teaching the handicapped. The general areas of investigation that have been delineated are 1) the curriculum, i.e., reading, spelling, penmanship, creative writing, and mathematical computation; 2) assessment and classroom performance measurement; 3) instructional procedures including the identification and arrangement of instructional cues, displaying format, length and duration of assignments, and classroom organization; 4) management of social behavior; and 5) the investigating, developing, and

refining of a variety of instructional programs. The accompanying flow chart (Figure 2) specifies the goals, specific objectives, research strategies, outcomes, and products and provides a picture of the research process.

Insert Figure 2 about here

Interrelated Activities of Research Teams

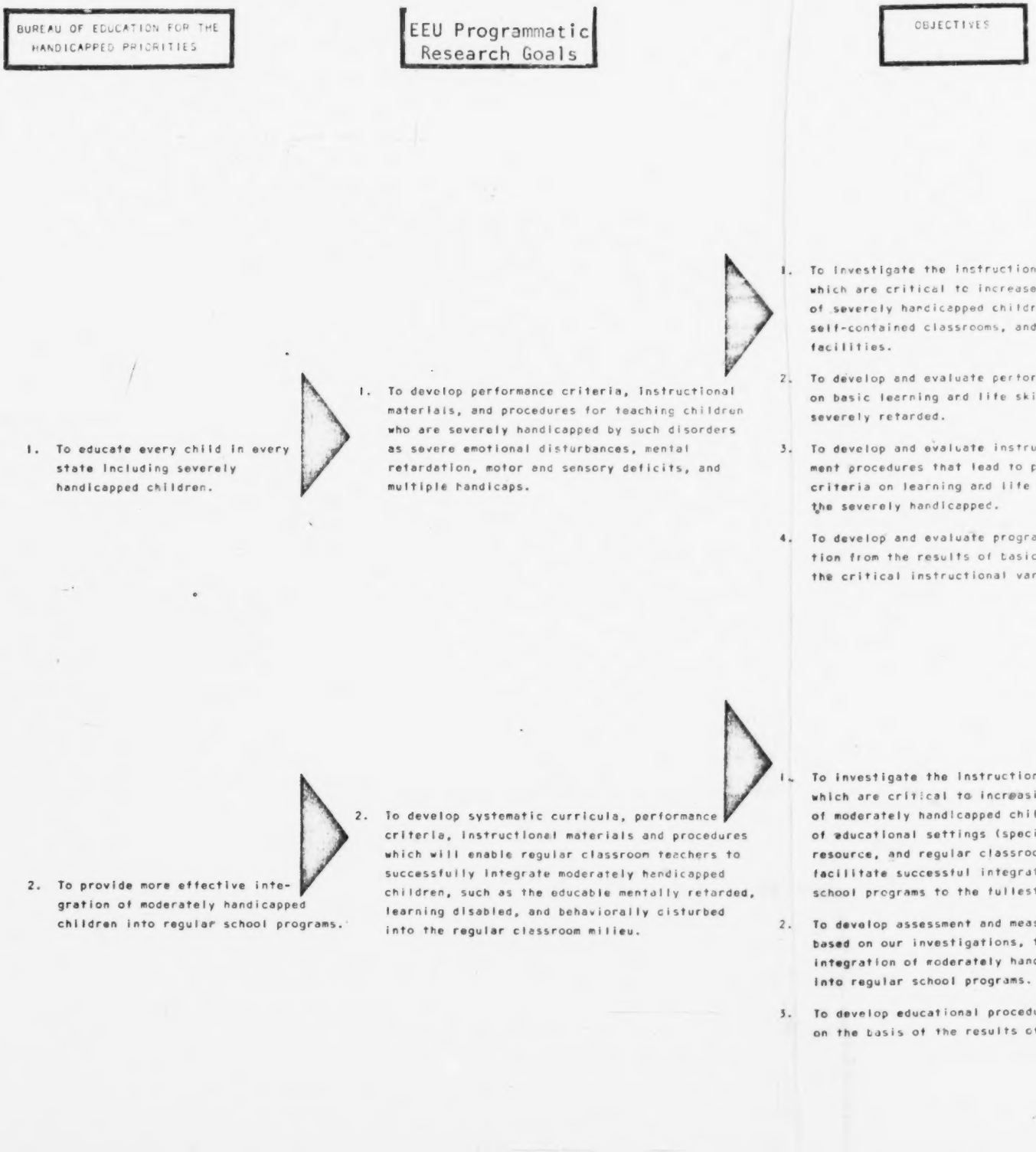
While each team has a specific major emphasis in programmatic investigation, all of the teams' research projects and the products that emanate from their activities are closely related, as can be seen from the above Flow Chart. The two major objectives of our proposal govern the many separate activities of the teams to promote the common specified objectives. The results of the teams' activities converge at many points, and reviews of these activities are scheduled quarterly throughout the project. These quarterly summary periods also serve as times for evaluating team progress and for making decisions about refinements or changes in activities as the teams progress. They are also an opportunity for these teams to share with each other information about the areas where outstanding progress is being made.

Four program coordinators are responsible for the research activities of each of the project investigators. Semimonthly meetings, chaired by the project director, are held to share information about progress and findings, and to integrate this information for possible alteration of the research activities of some of the research projects.

Our research will be programmed to flow in this general direction: sequence, continuity, and materials and outcomes. That is: For example, Team I will research the question of what characteristics instructional materials must have to be effective; Team II will design procedures for integrating

Figure 2

Project Flow Chart


BUREAU OF EDUCATION FOR THE HANDICAPPED PRIORITIES
EEU Programmatic Research Goals
OBJECTIVES
1. To educate every child in every state including severely handicapped children.
2. To provide more effective integration of moderately handicapped children into regular school programs.
1. To develop performance criteria, instructional materials, and procedures for teaching children who are severely handicapped by such disorders as severe emotional disturbances, mental retardation, motor and sensory deficits, and multiple handicaps.
2. To develop systematic curricula, performance criteria, instructional materials and procedures which will enable regular classroom teachers to successfully integrate moderately handicapped children, such as the educable mentally retarded, learning disabled, and behaviorally disturbed into the regular classroom milieu.
1. To investigate the instructional variables which are critical to increase the performance of severely handicapped children in special, self-contained classrooms, and in residential facilities.
2. To develop and evaluate performance criteria on basic learning and life skills for the severely retarded.
3. To develop and evaluate instructional management procedures that lead to performance criteria on learning and life skills for the severely handicapped.
4. To develop and evaluate programs of instruction from the results of basic research on the critical instructional variables.
1. To investigate the instructional variables which are critical to increasing performance of moderately handicapped children in a variety of educational settings (special, self-containe resource, and regular classrooms) and thereby t facilitate successful integration into regular school programs to the fullest extent possible.
2. To develop assessment and measurement procedure based on our investigations, to facilitate integration of moderately handicapped children into regular school programs.
3. To develop educational procedures and products on the basis of the results of these investiga

RESEARCH PROJECTS (STRATEGIES)

1. Project on instructional variables including drill and practice, antecedent, concurrent, and subsequent events, and contingencies of reinforcement relevant to increasing performance of severely handicapped children.
2. Project on the investigation of performance criteria for determining competencies on the basic learning and life skills.
3. Project on the investigation of the procedures of instruction leading to performance criteria in the basic learning and life skills for the severely retarded.
4. Project on the development and evaluation of instructional programs for the severely handicapped.

1. Project on the development of instructional programs for moderately handicapped children.
2. Project on integration of handicapped children.
3. Project on assessment of handicapped children.
4. Project on academic proficiency criteria.
5. Project on instructional procedures.
   a. Drill procedures for the acquisition of proficiency on basic academic skills.
   b. Effects of antecedent and concurrent events upon pupil performance.
   c. Effects of concurrently presented answers on the acquisition of academic skill.
6. Project on social behavior.
   a. Identification and assessment of socially adaptive and inappropriate classroom behavior.
   b. Investigation of managerial procedures dealing with social classroom behavior.
7. Project on daily performance measurement, charting and analyses.
   a. Measurement intervals.
   b. Measurement frequencies.
8. Project on the development and evaluation of instructional curricula in:
   a. Phonics
   b. Reading
   c. Spelling
   d. Penmanship
   e. Math

POTENTIAL EDUCATIONAL OUTCOMES AND PRODUCTS

Procedural Outcomes

1. A specification of performance criteria for competency in the basic skills involved in time telling, change making, newspaper reading, following verbal instructions, alphabetizing, and measuring.
2. Specific procedures of instruction leading to performance criteria in certain basic life skills.
3. Specific procedures for arranging antecedent and concurrent events for increasing performance.
4. Procedures for drill and practice.
5. Procedures for management of classroom behavior.

Instructional Products

Instructional Programs for:
- a. Time telling
- b. Change making
- c. Newspaper reading
- d. Following verbal instructions
- e. Discrimination programs for colors, shapes, numbers, and letters.
- f. Alphabetizing
- g. Borrowing
- h. Measuring

Procedural Outcomes

1. Specific Procedures for teaching:
   a. Reading
   b. Spelling
   c. Penmanship
   d. Math
2. Proficiency criteria for math, reading, writing, and spelling.
3. Procedures for time referencing in measurement of classroom behavior.
4. Procedures for administrative monitoring of classroom instruction.

Instructional Products

1. Instructional booklet for teaching:
   a. Spelling
   b. Penmanship
   c. Reading
   d. Math
2. Classroom Assessment Battery including:
   a. Probe Sheet
   b. Examiner's Sheet
   c. Demonstration Item
   d. Instructions for each probe.
3. Drill exercises on basic academic skills.
4. Definitions and performance criteria for successful social behavior.
5. Instructional programs for:
   a. Discrimination of letters and sounds.
   b. Phonics and reading
   c. Creative writing.

children into new programs and will provide useful information about sequencing materials; Team III will produce instructional programs for the two critical populations mentioned in our objectives, benefiting from the basic knowledge Team I will provide and from the practical procedures for integrating pupils into new programs that Team II will develop.

Administrative Processes

Information collected on each project is provided to project investigators and to the program administrator. The investigators use the data as feedback information for changing procedures to improve their outcomes. The program administrator uses the information to see that resources are being used efficienntly and to determine what endeavors need and merit more assistance (See Figure 3). The procedures used in collecting data for administrators should be uniform from project to project and one effective technique for assuring this is the Programmed Evaluation and Review Technique (PERT) system (Tracy, Brunstrom, & Dudley, 1968).

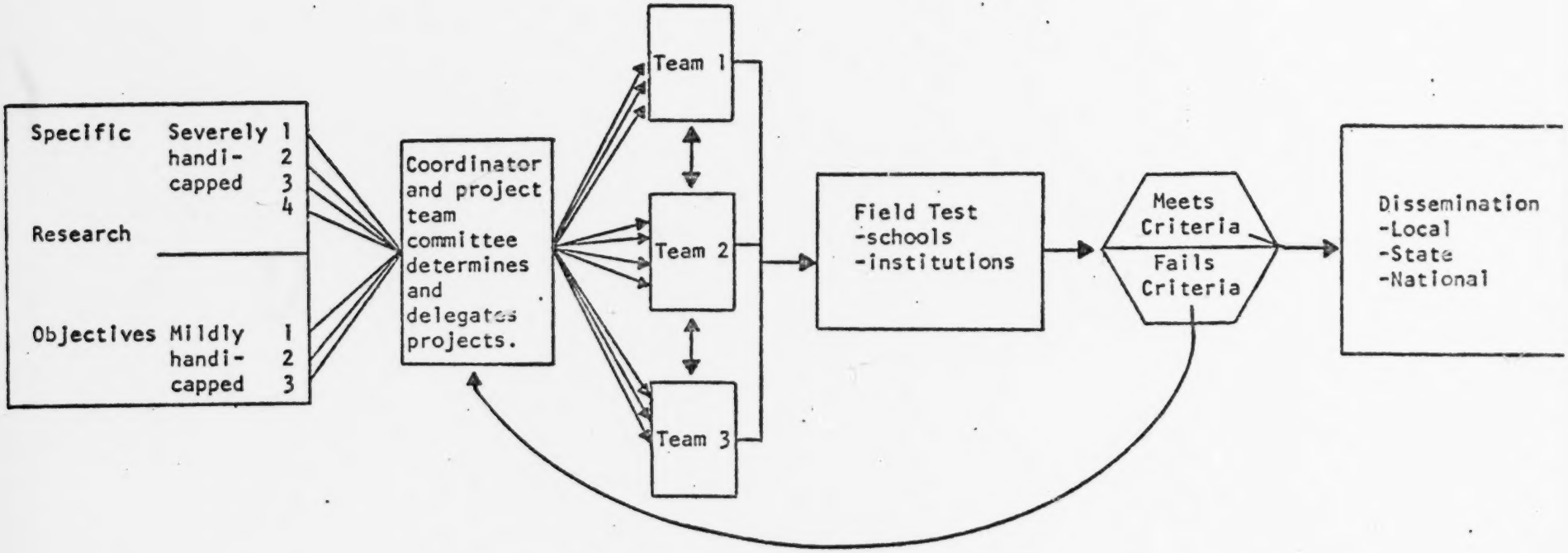
Insert Figure 3 about here

Formative data for internal administrative purposes will also use program review and evaluation techniques. The PERT diagrams will be developed at two levels, the first providing a global view showing only primary objectives, and the other showing a detailed view of the ongoing working relationship quarter by quarter. This is generally necessary as a practical matter because of the complexity of programmatic research. This also allows for corrective feedback in the PERT itself, and, as a result, becomes self-adjusting for more accurate planning.

The PERT allows resource forecasting and accounting of manpower, space, pupil populations, materials, and support services. This type of information is

Figure 3

Organizational Structure



also useful in summative reports. Formative reports will be greatly simplified because all that will have to be specified in them is the project's proximity to its objectives. If this is not adequate, more attention can be given on the basis of exception reporting. Further, in the process of developing PERT diagrams, an additive effect on the total results of the project is experienced owing to improved communication among staff members.

Summary

It has been documented by several writers (Smith, 1971; Martin, 1972) that there are many critical behavioral research needs in special education. Two of these needs, which fit within the realm of applied research, operate in the natural environment, and which permit a precise description of the interactions between behavioral and environmental events are: 1) the development of new instructional technology based on empirical documentation, and 2) the development of clinical teaching procedures which specify the important educational variables and provide the diagnostic and individualized prescriptive teaching to meet these needs.

Past experience has shown the functional analysis of behavior model to be an effective research methodology in the area of applied research. However, this same experience has shown that research in special education has been characterized by lack of reliability, control, and generality (Hanley, 1970). It appears that one effective organizational procedure which can be used to overcome the deficits of earlier research is the programmatic research model. By its very structure, programmatic research requires investigators to make administrative decisions which will result in a more systematic examination of the critical variables of instruction.

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